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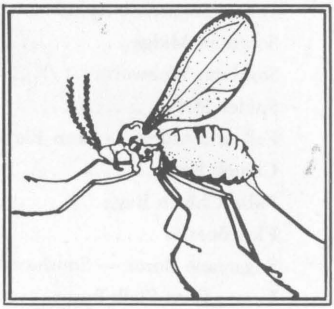
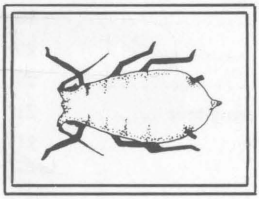
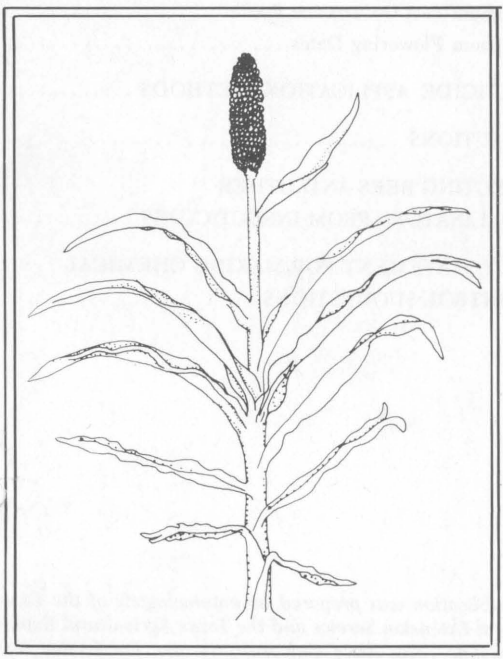
# Insect and Mite Pests of Grain Sorghum – Management Approaches







TEXAS AGRICULTURAL EXTENSION SERVICE
THE TEXAS A&M UNIVERSITY SYSTEM
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*This publication was prepared by entomologists of the Texas Agricultural Extension Service and the Texas Agricultural Experiment Station, The Texas A&M University System. For further information, contact your county Extension agent, area or county Extension entomologist or the Extension entomologist, Texas A&M University, College Station, Texas 77843.*

# Insect and Mite Pests of Grain Sorghum – Management Approaches

Five to six million acres of Texas farmland are utilized annually to produce grain sorghum. The potential economic value of sorghum, primarily a livestock and poultry feed, makes pest control an important factor in efficient and profitable production. Grain sorghum also is used extensively in rotation with cotton and soybeans and is important to weed and some disease control strategies.

Grain sorghum and other crops grown in a community share important insect relationships. Beneficial insects that reproduce in maturing grain sorghum often move to cotton and other crops and aid in the control of numerous pests. Therefore, control decisions carried out in sorghum may affect pests and beneficial insect numbers in neighboring crops.

Insect and mite pests of grain sorghum may reach damaging levels throughout the production season. Producers should be aware of the probable occurrence of various pests (Figure 1, page 12), be able to correctly identify pests and be aware of the various methods that aid in their suppression. Proper choice and careful use of insecticides are important. Indiscriminate insecticide use can result in pest resistance, resurgence or secondary pest outbreak. Selective insecticide use greatly reduces the occurrence of these problems.

Proper crop production planning and seedbed preparation, as well as periodic in-season field

monitoring for the occurrence of pest problems, are important. Plant damage does not always relate directly to insect numbers. Factors such as plant vigor and stage of growth, moisture conditions, time of year, parasite and predator abundance, and crop rotation are equally important.

Descriptions of pests and their damage, methods for making insect and mite counts and various pest control methods are included in this Extension publication.

## SOIL PESTS OF GRAIN SORGHUM

True and false wireworms, white grubs, corn rootworms and cutworms are the most common soil pests of sorghum in Texas. Non-crop plant materials are important food sources for soil pests. Cultivation practices and/or the use of herbicides that reduce crop residues and provide for weed-free fields are important in reducing soil pest densities. Proper seedbed preparation that provides for rapid seedling emergence and establishment and preplant soil inspection for the presence of soil pest populations are important. If damaging soil pest densities are detected, approved insecticides may be applied to the seed prior to planting or to the soil using the broadcast, rowband or in-furrow method of application. Preplant seed treatment or planter box treatment has proved effective in controlling wireworms and corn rootworms where light populations are present. High populations of these pests require broadcast or band application of approved insecticides. Effective control of white grubs is usually obtained only with the broadcast application technique.

### Seed Treatment

On-farm seed treatment can be accomplished by using a concrete mixer, custom-designed seed treatment equipment or other similar seed treatment devices. Seed should be evenly coated with insecticide. Sprinkle 1 pint of water on each 100 pounds of seed and mix to evenly coat the seed with moisture. Add the correct amount of insecticide to the seed as specified by the pesticide label and mix thoroughly.

Insecticides such as malathion or methoxychlor are often applied to seed to control stored grain pests. These insecticides are not effective substitutes for the control of soil pests.

### Planter Box Treatment

Some insecticides are formulated as materials to be applied to seed in the planter box. This method is

effective only against those pests and their population levels which can be controlled effectively by the previously discussed direct seed treatment. Use this soil insect control technique in strict accordance with recommendations on the insecticide label.

Uniform distribution of insecticides throughout the seed mass in the planter box is important. Avoid contact of insecticides to the skin and eyes and/or breathing of insecticide dust.

## Soil Treatment

Insecticide application for controlling wireworms, corn rootworms, white grubs and cutworms must be made before the crop is planted or at planting time. Granular, wettable powder or emulsifiable concentrate formulations may be used. The insecticide formulation used usually depends on available application equipment.

***Preplant.*** Soil treatments can be applied before planting. A broadcast application results in the best control of soil insects and is the only means of controlling heavy infestations of white grubs. However, it is more expensive because of the additional insecticide required compared with a rowband or in-furrow treatment. Apply broadcast applications uniformly to plowed ground and disk immediately to a depth of 3 to 5 inches.

Where sorghum is to be planted on beds, special equipment for insecticide incorporation to a depth of 3 to 5 inches is required for preplant soil treatment. This often is referred to as a row-incorporated treatment. Row treatments must be made after the bed is prepared for planting because any manipulation, such as bed shaping, likely will alter the position of the insecticide in the row. Row or band application can be applied when bed shaping is done. A treated band 7 to 10 inches wide and 3 to 5 inches deep, with seed placed in the center of the treated band, is necessary to obtain maximum control. For narrow-row plantings, use rates recommended on the insecticide label.

***At planting time.*** Insecticides also may be applied to the soil at planting time by the in-furrow technique. This method is less applicable where a bed planter is used because insecticide incorporation within the root zone may defeat major objectives of bed planting. Where bed planting is to be used, soil insecticides may be incorporated in a band when bed shaping is done, as previously described.

With lister or conventional planters, mount spray or granular application equipment on the planter with the nozzle or spout just behind the opening plow and in front of the covering shovels. Adjust nozzles or

spouts so that the treatment band is about 7 to 10 inches wide and the seed furrow, as well as the covering soil, is treated. Incorporation accomplished during seed covering generally is adequate. Applying the insecticide directly in the seed furrow and in direct contact with the seed may affect germination. Poor control may result from in-furrow application where pest populations are high.

For specific pesticide control suggestions, limitations and rates of each insecticide labeled for use on sorghum, refer to the insecticide suggestion tables.

### Wireworms

True and false wireworms are the immature stages of click and darkling beetles. Wireworms are generally shiny, slender, cylindrical and hardbodied. They range in color from yellow to brown.

Wireworms damage grain sorghum by destroying planted seed and, to a lesser degree, by feeding on seedling plant roots. Stand establishment and plant vigor is reduced. Sampling of fields for the presence of wireworms prior to planting is recommended. Soil samples 1 foot square by 4 inches deep should be examined thoroughly. If two or more wireworm larvae per linear foot are detected, control measures should be implemented.

Cultural practices that reduce non-crop plant materials in fields or rotation to tap-rooted crops that are unfavorable for wireworm development are important non-chemical control methods.

Approved insecticides, applied as seed treatments or planter box treatments, are effective in controlling wireworms. See seed treatment, page 4, for procedures.

### White Grubs

White grubs are the larval stages of May or June beetles. Larvae are characteristically "C-shaped" with a white body and tan to brown head. Larvae vary in size according to age and species. The last abdominal segment is transparent, and digested material can be seen in the larvae.

Damage to plants results from larvae feeding on the roots. Small seedlings often are killed, resulting in stand loss. Severely pruned roots of larger plants result in stunting, plant lodging and increased susceptibility to drought conditions and stalk rot organisms.

Base soil application of insecticides to control white grubs after completing soil sampling. Examine one square-foot soil sample for each 5 to 10 acres before planting. Research data have shown that an average of one white grub per square foot is sufficient

to cause significant stand loss. Best control results are obtained by broadcasting an approved insecticide to plowed ground before planting, followed immediately by thorough incorporation by disking into the top 3 to 5 inches of soil (see soil treatment, page 5). Where grub numbers are high — approximately two per cubic foot — seed-furrow treatments are not sufficiently effective.

**SUGGESTED INSECTICIDE CONTROL**

| Pest | Insecticides (listed alphabetically) Toxicant per gallon or pound | Concentrate per acre | Days from last application to: Harvest | Grazing |
|---|---|---|---|---|
| White grubs | Dasanit (15% G or 6 lb.) | 6.5 lb. | 0 | 0 |
| | | 1.7 fl. oz./ 1000' of row | 0 | 0 |
| | Diazinon (14.3% G or 4 lb.) | 7-10 lb. | 7 | 0 |
| | | 1 1/2-2 qt. | 7 | 0 |

**Remarks**

*Dasanit.* Apply granules in seed-furrow at planting as a 2-inch band, 1/2 inch above seed. Do not apply directly to seed. Apply specified dosage in 20 gallons of water as a 3- to 4-inch band in the seed-furrow at planting, 1/2 foot above seed. Do not apply directly to seed.

*Diazinon.* Preplant broadcast applications are most effective though soil incorporation is necessary. Do not apply directly to seed. Make application where populations average one grub per square foot of soil.

## Corn Rootworms

Corn rootworms are the immature larval stages of a complex of leaf-feeding beetles. The southern corn rootworm is the most important sorghum pest of the rootworm complex. Rootworms are small, brown-headed, creamy white larvae that burrow into the roots and crowns of sorghum plants. Reduced stand establishment and plant vigor, and the occurrence of dead heart in young plants, are characteristic of rootworm damage. Plant lodging may occur later in the season.

Presently no insecticides are labeled for in-furrow or preplant use for control of corn rootworm. Seed treatments with heptachlor or lindane are effective in controlling light infestations of corn rootworms at planting time. See seed treatment, page 4, for procedures.

## Cutworms

A complex of cutworms can damage grain sorghum. Cutworms are the immature stages of moths that are active at night. Grassy sod and weedy fields are attractive to moths for egg laying. Newly hatched cutworms feed on sorghum seedlings and clip the

above ground portion of the plant from the root system. Some subterranean cutworms feed on the seedling root system. Cutworm infested fields have the appearance of being closely grazed and damage may be clumped or occur in spots of the field. Larval feeding commonly occurs at night.

Cultivation practices and/or the use of herbicides that reduce non-crop plants in season and in fallowed fields are important cutworm control methods.

Aerial or ground-applied, approved insecticides are effective in control of cutworm damage to established sorghum stands.

**SUGGESTED INSECTICIDE CONTROL**

| | Insecticide | | Days from last application to: | |
|---|---|---|---|---|
| Pest | Toxicant per gallon or pound | Concentrate per acre | Harvest | Grazing |
| Cutworms | Toxaphene (6 lb.) | 1 1/3 qt. | See remarks below.* | |

**Remarks**

*Apply thoroughly to soil and seedling plants when cutworms are causing damage.

*Toxaphene.* Do not apply within 28 days of harvest. Apply only once after heads start to form. Do not graze dairy cattle or animals being finished for slaughter on treated fields. Do not ensile treated forage.

# ABOVE GROUND PESTS OF GRAIN SORGHUM

## Greenbugs

Greenbugs are aphids that suck plant juices and inject toxin into sorghum plants. These aphids are pale green, approximately 1/16 of an inch long with characteristic dark green strips occurring on the back. Greenbugs develop in large numbers under favorable conditions and may cause economic losses. The extent of greenbug damage in sorghum is dependent upon greenbug numbers, plant size, vigor and stage of growth, moisture conditions and effectiveness of parasites and predators. Producers are cautioned to observe plant conditions closely as well as the development of greenbug numbers and damage. Damage at the seedling stage may result in stand loss. Greenbugs usually feed in colonies on the underside of leaves. Characteristic reddened spots on the upper leaf surface and the occurrence of honeydew are associated with greenbug feeding damage.

Producers in areas of the state where greenbugs occur should consider planting greenbug-resistant

sorghum hybrids. These hybrids may become the most effective means of controlling the greenbug. Producers should be aware that the primary type of resistance is tolerance, and should not expect plants to be free of greenbugs. However, resistant hybrids generally are infested with fewer greenbugs than susceptible hybrids. Based on previous research, the damage threshold for resistant sorghums is the same as for susceptible sorghums.

Treat plants up to about 6 inches in height when visible yellowing of the plant or greenbug colonies are observed and stand loss is probable. Research data indicates that larger plants up to the pre-boot stage will tolerate more greenbugs than seedling sorghum. Control large numbers of greenbugs on this size before any entire leaves are killed.

Yield reductions during the pre-boot, boot, flowering and grain development stages are dependent on greenbug numbers, length of time that greenbugs have infested plants and plant condition. High numbers on pre-boot and older plants can cause yield reduction and cause weakened plants that may lodge at a later date.

In the Texas Blacklands, insecticide applications are suggested if greenbugs are colonizing on the upper leaves of booting sorghum and death of tissue is occurring. Plants can tolerate approximately 30 percent leaf loss before yield reduction occurs. Indications are that greenbug numbers which cause the death of more than two normal-sized leaves after flowering and before the hard-dough stage should be controlled.

The above general guides are based on the assumption that the greenbug buildup is occurring so rapidly that control by beneficial insects is not effective. Also, plants undergoing drought or other stress cannot support as many greenbugs without suffering yield reductions.

The following table will serve as a general guide in determining the need for treatment:

| Plant Size | When to Treat |
|---|---|
| Emergence to about 6 inches | Visible damage (plants beginning to yellow) with colonies of greenbugs on plants |
| Larger plant to pre-boot | Greenbug colonies causing red spotting or yellowing of leaves and before any entire leaves are killed |
| Pre-boot to heading | Before the death of one functional leaf |
| Heading to hard-dough | When greenbug numbers are sufficient to cause death of two normal-sized leaves |

## SUGGESTED INSECTICIDE CONTROL

| Pest | Insecticides (listed alphabetically) Toxicant per gallon or pound | Concentrate per acre | Days from last application to: Harvest | Grazing |
|---|---|---|---|---|
| | Attention: Review all remarks thoroughly | | | |
| Greenbug | Carbofuran (Furadan) (4.0 lb. flowable) | 1/2-1 pt. | See remarks. | |
| | Carbophenothion (Trithion) (8 lb.) | 1/5-1/2 pt. | See remarks. 21 | 21 |
| | Demeton (Systox) (2 lb.) | 2/5-1 pt. | See remarks. 35 | 35 |
| | Diazinon (4 lb.) | 1/4-1 pt. | 7 | 0 |
| | Dimethoate (Cygon) (4 lb.) | 1/2-1 pt. | See remarks. 28 | 28 |
| | (De-Fend) (2.67 lb.) | 1/3-1 1/2 pt. | 28 | 28 |
| | Disulfoton (Di-Syston) (8 lb.) | 4-8 fl. oz. | See remarks. 7 | 28 |
| | (15% G) (whorl application) | 3.5-6.7 lb. | 30 | 14 |
| | Malathion (5 lb.) | 1/2-1 1/2 pt. | 7 | 7 |
| | Meta-Systox-R (MSR) (2.0 SC) | 1-2 pt. | 45 | 21 |
| | Parathion (4 lb.) | 1/4-2 pt. | 12 | 12 |
| | Phorate (Thimet) (15% G) | 5-6.5 lb. | See remarks. 28 | 28 |

Difficulty in controlling greenbugs has been encountered in several counties of the Texas High Plains. Resistance exists to most registered materials in some localized areas and continued extensive use of insecticides is apt to expand the resistance problem. Where resistance exists in an area, the initial insecticide application should be made at the higher labeled dosage rate. *See remarks for use of lower rates.*

### Remarks

See *Greenbugs* on pages 8-9 for details on timing applications, type of damage and need for control. It is important to be able to distinguish between the greenbug and other aphids (pages 8-11) occurring in grain sorghum. Lower rates in the table have been effective in controlling economic infestations. In areas of no insecticide resistance, effective use of reduced rates is dependent on proper application timing. Reduced rates are designed to suppress greenbug densities below injurious levels while providing maximum protection of beneficial species. Using insecticides to achieve total elimination of greenbugs is not desirable. To conserve beneficial species, a sub-economic greenbug density must be maintained as a food source.

*Carbofuran.* Do not apply after heads emerge from the boot. Do not graze treated fields or cut for silage or forage. Do not apply to grain sorghum prior to rogueing. Workers should not enter fields within 14 days of application unless full protective equipment is used.

*Carbophenothion.* Do not apply more than twice per season.

*Demeton.* Apply once per season.

*Dimethoate.* Do not apply more than three times per season.

*Disulfoton.* Do not apply foliar spray or granules more than three times per crop season. Granular formulation recommended as whorl application only.

*Meta-Systox-R.* Apply with not less than 1 gallon of water per acre, up to 3 applications per season. Do not use on sweet sorghum. Slight phytotoxicity may occur in some sorghum hybrids.

*Parathion.* Do not substitute with methyl parathion.

*Phorate.* Whorl application only; only one application per season.

## Corn Leaf Aphid

Heavy populations of this bluish-green aphid, characterized by black legs and antennae, sometimes cause damage to seedling grain sorghum. Larger sorghum plants in pre-boot, boot and later growth stages generally can tolerate large numbers of aphids without significant damage. Research has shown that yield losses have occurred only where corn leaf aphids cause stand loss of seedling plants. Although rare, head infestations have caused harvesting problems. Corn leaf aphids are important hosts for developing populations of beneficial insects that are important in the control of greenbugs and other pests of sorghum.

## Yellow Sugarcane Aphid

This lemon-yellow aphid is covered with small spines and has two double rows of dark spots down the back. Aphids inject a toxin during feeding which causes purple-colored leaves in seedling plants, and stunting and yellowing of more mature leaves. This aphid has caused death of plants in the pre-boot stage. Five to ten aphids per leaf can kill grain sorghum up to 18 inches high. Treatment should begin at the first sign of damage in seedling sorghum. The yellow sugarcane aphid has a wide, wild host range and is often found on Johnsongrass in the Gulf Coast, Blacklands and Rolling Plains counties of Texas.

**SUGGESTED INSECTICIDE CONTROL**

| Pest | Insecticides (listed alphabetically) Toxicant per gallon or pound | Concentrate per acre | Days from last application to: Harvest | Grazing |
|---|---|---|---|---|
| Yellow sugarcane aphid | Demeton (Systox) | | See remarks. | |
| | (2 lb.) | 1 pt. | 35 | 35 |
| | (6 lb.) | 1/3 pt. | 35 | 35 |
| | Disulfoton (Di-Syston) | | See remarks. | |
| | (8 lb.) | 4-8 fl. oz. | 34 | 34 |
| | Parathion | | See remarks. | |
| | (4 lb.) | 1 pt. | 12 | 12 |

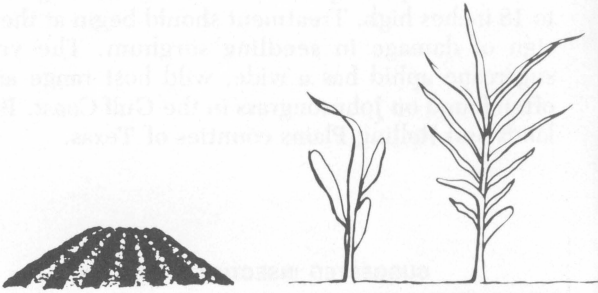
**Remarks**

*Demeton.* Apply only once per season.

*Disulfoton.* A maximum of 3 foliar applications may be made at rates of 8 fl. oz. or less per acre.

*Parathion.* Do not substitute with methyl parathion.

WG
WW
CW
CRW
GB
YSA
CLA
SB
CB
FAW
CEW



Stage of Pla

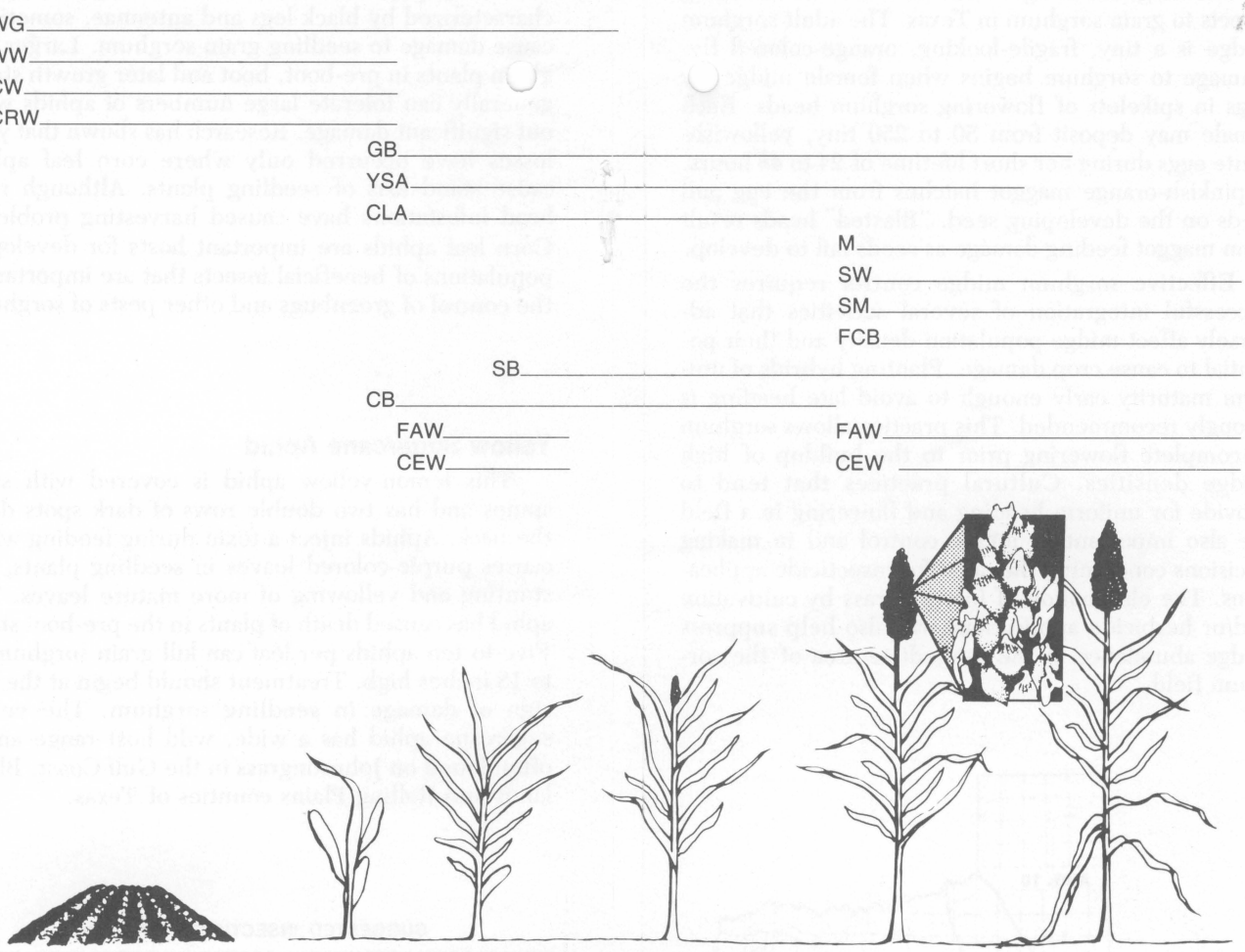
Preplant | Vegetative Growth (Seedling) (Preboot)

**Profile Legend**

WG — White Grub
WW — Wireworm
CW — Cutworm
CRW — Corn Rootworm
GB — Greenbug
YSA — Yellow Sugarcane Aphid
FAW — Fall Armyworm
CLA — Corn Leaf Aphid
M — Midge
SW — Sorghum Webworm
SM — Spider Mite
CB — Chinch Bug
FCB — False Chinch Bug
SB — Stalk Borers
CEW — Corn Earworm

Figure 1. Sorghum pests occurrence profile*.

# SORGHUM PESTS OCCURRENCE PROFILE




**Stage of Plant Development**

**Preplant** | **Vegetative Growth (Seedling) (Preboot)** | **(Boot Stage)** | **Flowering** | **Grain Maturity**

**Profile Legend**

WG — White Grub
WW — Wireworm
CW — Cutworm
CRW — Corn Rootworm
GB — Greenbug
YSA — Yellow Sugarcane Aphid
FAW — Fall Armyworm
CLA — Corn Leaf Aphid
M — Midge
SW — Sorghum Webworm
SM — Spider Mite
CB — Chinch Bug
FCB — False Chinch Bug
SB — Stalk Borers
CEW — Corn Earworm

*The occurrence and development of various sorghum pests are usually closely related to plant development and various environmental factors. Although the severity of insect problems cannot be predicted, this pest occurrence profile indicates insect and mite pests that ***may*** attack sorghum in various stages of development. Careful field inspection to determine the presence and damage potential of each pest is strongly advised.

Figure 1. Sorghum pests occurrence profile*.

# OCCURRENCE PROFILE

M_____

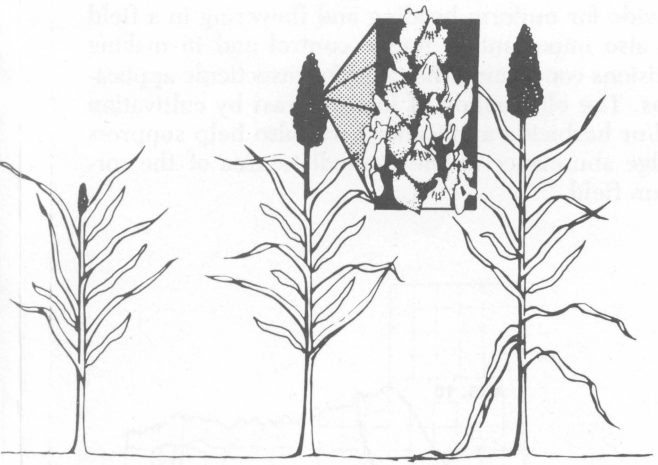
SW_____

SM_____

FCB_____

FAW_____

CEW _____



**ınt Development**

**Flowering** **Grain Maturity**

**(Boot Stage)**

*The occurrence and development of various sorghum pests are usually closely related to plant development and various environmental factors. Although the severity of insect problems cannot be predicted, this pest occurrence profile indicates insect and mite pests that ***may*** attack sorghum in various stages of development. Careful field inspection to determine the presence and damage potential of each pest is strongly advised.

## Sorghum Midge

The sorghum midge is one of the most damaging insects to grain sorghum in Texas. The adult sorghum midge is a tiny, fragile-looking, orange-colored fly. Damage to sorghum begins when female midges lay eggs in spikelets of flowering sorghum heads. Each female may deposit from 50 to 250 tiny, yellowish-white eggs during her short lifetime of 24 to 48 hours. A pinkish-orange maggot hatches from the egg and feeds on the developing seed. "Blasted" heads result from maggot feeding damage as seeds fail to develop.

Effective sorghum midge control requires the successful integration of several activities that adversely affect midge population density and their potential to cause crop damage. Planting hybrids of uniform maturity early enough to avoid late heading is strongly recommended. This practice allows sorghum to complete flowering prior to the buildup of high midge densities. Cultural practices that tend to provide for uniform heading and flowering in a field are also important in midge control and in making decisions concerning the need for insecticide applications. The elimination of Johnsongrass by cultivation and/or herbicide applications will also help suppress midge abundance in the immediate area of the sorghum field.

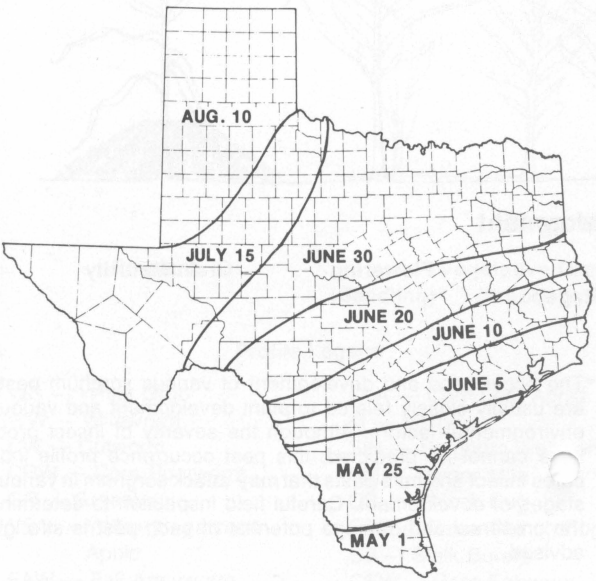



Figure 2. Estimated latest sorghum flowering dates most likely to escape significant sorghum midge damage.

To determine the need for insecticide control, an assessment of crop development, yield potential and midge density is required. Daily evaluation of these factors is encouraged during periods of usual midge activity.

Since midge lay eggs in flowering sorghum heads (yellow anthers exposed on individual spikelets), damage can occur until the entire head or field has been pollinated. The period of midge susceptibility may last from 7 to 9 days (individual head) to several weeks (individual field) depending on the uniformity of flowering. The map on page 14 is provided as a *guideline* to midge damage associated with sorghum flowering.

To determine the presence of sorghum midge, fields should be inspected during the morning or early evening hours when midge are most active. Midge adults can be detected crawling on or flying about flowering grain heads. Use of a clear plastic bag as a trapping device, quickly slipped over sorghum heads, is helpful in detecting and counting midge adults.

Apply an approved insecticide when 25 to 30 percent of the heads begin to flower and the number of midge adults averages one per head. If adults are still active 3 to 5 days later, immediately apply a second treatment. Because midge frequently reinfest treated fields, several insecticide applications at 3-day intervals may be justified if the yield potential is high and midge are abundant. For additional information see L-842, *The Sorghum Midge and Its Control.*

**SUGGESTED INSECTICIDE CONTROL**

| Pest | Insecticides (listed alphabetically) Toxicant per gallon or pound | Concentrate per acre | Days from last application to: Harvest | Grazing |
|---|---|---|---|---|
| Sorghum midge | Carbaryl (Sevin) (80% WP) | 1 1/4-1 4/5 lb. | 21 | 0 |
| | Carbophenothion (Trithion) (8 lb.) | 1/2 pt. | See remarks. 21 | 21 |
| | Diazinon (4 lb.) | 1/2 pt. | 7 | 0 |
| | Disulfoton (Di-Syston) (8 lb.) | 4-8 fl. oz. | 34 | 34 |
| | Ethion (4 lb.) | 1/2-1 pt. | See remarks. 30 | 30 |
| | Malathion ULV (95%) | 8 oz. | 7 | 7 |
| | Methomyl (Lannate) (1.8 lb.) | 1-2 pt. | 14 | 14 |
| | Parathion (4 lb.) | 1 pt. | 12 | 12 |

**Remarks**

*Carbophenothion.* Up to two applications per season.

*Disulfoton.* Do not apply more than three times per season.

*Ethion.* Do not apply more than three times per growing season. Slight phytotoxicity may occur in some sorghum hybrids.

*Parathion.* Do not substitute with methyl parathion.

## Sorghum Webworm

The sorghum webworm occurs primarily in the more humid eastern half of the state.

Webworm larvae are reddish to yellowish-brown, somewhat flattened and marked with four longitudinal reddish to black strips. Larvae are approximately 1/2 inch long when mature and densely covered with spines and hair.

Large numbers of webworms, especially in late planted sorghum, can occur in heads and gnaw circular holes in maturing grain and feed on the starchy contents.

Plowing under crop residues to destroy overwintering larvae and early planting are important cultural control practices.

During the production season, make frequent head inspections beginning in the flower stage and continuing until hard dough. To examine heads for sorghum webworm, beat heads on a piece of paper or white handkerchief. Small larvae (less than 1/8 inch long) commonly overlooked during head inspections will be detected with this method. Application of an approved insecticide is suggested when five or more small larvae are found per head. Begin inspection of sorghum heads soon after flowering.

**SUGGESTED INSECTICIDE CONTROL**

| Pest | Insecticides (listed alphabetically) Toxicant per gallon or pound | Concentrate per acre | Days from last application to: Harvest | Grazing |
|---|---|---|---|---|
| Sorghum webworm | Carbaryl (Sevin) (80% WP) | 1 1/2-2 1/2 lb. | 21 | 0 |
| | Parathion (4 lb.) | 1/2-5/8 pt. | 12 | 12 |
| | Toxaphene (6 lb.) | 2 1/2-3 1/3 pt. | See remarks under cutworm. | |

**Remarks**

*Parathion.* Do not substitute with methyl parathion.

## Spider Mites (*Oligonychus* spp.)

High numbers of spider mites have been observed on sorghum in the more arid areas of Texas. Newly hatched, light-colored spider mites become dark

green after feeding on sorghum with sucking mouthparts that withdraw plant fluids. Spider mites also produce webbing that can cover leaves and the sorghum head during periods of heavy infestation. Although mites can be observed early in the growing season, density increases generally occur after the boot stage of development. Mite populations normally become established on the underside of lower plant leaves. Mites migrate upward and sometimes move into the head on sorghum as mite density and plant damage increase. Extremely high populations cause extensive webbing of sorghum heads and may be associated with stalk rot and lodging. Periods of hot, dry weather favor rapid mite population increase. Plants will tolerate mite damage better if protected from water stress. Heavy irrigation after mites increase will not suppress mite densities.

Mite density, size and maturity of the plants will dictate the need for miticide applications. Research has shown no yield increase or reduced plant lodging following treatments in the hard dough or later stages of crop maturity. Additionally, erratic control with all recommended materials has been experienced in some areas (Trans Pecos and certain locations of the High Plains) of Texas. Thorough application is required; apply at least 3 to 5 gallons of spray mix per acre.

**SUGGESTED MITICIDE CONTROL**

| Pest | Insecticides (listed alphabetically) Toxicant per gallon or pound | Concentrate per acre | Days from last application to: Harvest | Grazing |
|---|---|---|---|---|
| Spider mites | Carbophenothion (Trithion) (8 lb.) | 1/2 pt. | See remarks. 21 | 21 |
| | Comite (6.75 lb.) | 1 1/2-2 pt. | See remarks. 30 | 0 |
| | Disulfoton (Di-Syston) (8 lb.) (excluding Trans-Pecos area) | 8-16 fl. oz. | See remarks. 7 | 28 |
| | Ethion (4 lb.) | 1 pt. | See remarks. 30 | 30 |
| | Methidation (Supracide) (2 lb.) | 2 pt. | 30 | 30 |
| | Meta-Systox-R (MSR) (2.0 lb. SC) | 1-2 pt. | See remarks. 45 | 21 |
| | Phorate (Thimet) (15% G) | 5-6 lb. | See remarks. 28 | 28 |

**Remarks**

*Carbophenothion.* Up to two applications per season.

*Comite.* Do not apply more than once per season. Slight phytotoxicity may occur on some sorghum hybrids.

*Disulfoton.* The 8 fluid ounce rate may be applied as directed above for aphids. Rates above 8 fluid ounces per acre should not be applied if any soil applications have been made. If rates above 8 fluid ounces per acre are used, do not apply more than twice per crop season nor within 7 days of harvest of grain or 28 days of use as forage or fodder.

*Ethion.* Do not apply more than three times per growing season. Slight phytotoxicity may occur in some sorghum hybrids. Has been effective only in South Texas and Gulf Coast areas.

*Meta-Systox-R.* Do not apply more than three times per season. Do not use on sweet sorghum. Certain sorghums may be sensitive to MSR.

*Phorate.* Whorl application only. Only one application per season.

*Supracide.* Up to three applications per season at 10- to 14-day intervals. Slight temporary phytotoxicity may occur.

## Fall Armyworm — Corn Earworm

Fall armyworm and corn earworm moths often deposit eggs on the leaves or heads of sorghum plants. Larvae of these moths vary in color from pale green to almost black, with longitudinal stripes running along the back.

On young sorghum, corn earworm and fall armyworm often feed in the plant whorl. As leaves emerge from the whorl, "ragged shot hole" damage is evident. Although this damage may be dramatic, experimental results indicate that control of "worms" in the whorl stage seldom is economically justified. Insecticide control may be necessary if examination of larval feeding indicates damage to the developing head or growing point. Larvae may also attack developing sorghum heads. Corn earworms are cannibalistic, therefore influencing the number of larvae usually occurring per head.

Early planting practices that encourage the development of beneficial insect populations aid in the control of armyworms and earworms. Planting "open-headed" sorghum hybrids also tends to reduce the occurrence of larvae in sorghum heads. When populations exceed an average of two small larvae per head in maturing grain sorghum, control measures should be implemented. Begin inspection of sorghum heads soon after flowering.

**SUGGESTED INSECTICIDE CONTROL**

| Pest | Insecticides (listed alphabetically) Toxicant per gallon or pound | Concentrate per acre | Days from last application to: Harvest | Grazing |
|---|---|---|---|---|
| Fall armyworm | Carbaryl (Sevin) (80% WP) | 1.25-1.8 lb. | 21 | 0 |
| Corn earworm | Methomyl (Lannate)* (1.8 lb.) | 1-2 pt. | 14 | 14 |
| | (90% SP) | 1/4-1/2 lb. | 14 | 14 |
| | Parathion (4 lb.) | 1/2-1 pt. | 12 | 12 |
| | Toxaphene (6 lb.) | 1 qt. | 28 | See remarks. |

**Remarks**

**Methomyl.* Not labeled for control of fall armyworm.

*Parathion.* Do not substitute with methyl parathion.

*Toxaphene.* Apply only once after heads start to form. Do not graze dairy animals or animals being finished for slaughter in treated fields. Do not ensile treated forage.

## Chinch Bugs

Chinch bugs are sporadic pests of sorghum in Texas. The black bodied adult chinch bug has reddish-yellow legs and fully developed wings. The mostly white wings are marked with a triangular black spot at the middle of the outer wing margin. Immature chinch bugs resemble adults in shape but are reddish in color with a white band across the back.

Adult and immature chinch bugs suck plant juices and cause leaf redding. Wilting and severe stunting of plants attacked by chinch bugs has been noted from the time of seedling emergence until plants are 18 inches high. Chinch bugs are favored by hot, dry weather and large numbers of immature bugs often migrate from wild bunch grasses or small grains to congregate and feed behind the sheaths of lower sorghum plant leaves.

Apply insecticide treatments when two or more adult chinch bugs are found on 20 percent of the seedlings less than 6 inches high. Make at least five random checks per field. On taller plants, initiate control when immature and adult bugs infest 75 percent of the plants. When using ground application equipment, insecticide applications should be made through nozzles directed at the infested portion of the plants. Satisfactory insecticide control is seldom obtained on booting or larger plants.

**SUGGESTED INSECTICIDE CONTROL**

| Pest | Insecticides (listed alphabetically) Toxicant per gallon or pound | Concentrate per acre | Days from last application to: Harvest | Grazing |
|---|---|---|---|---|
| Chinch bug | Parathion (4 lb.) | 1/2-5/8 pt. | See remarks. 12 | 12 |
| | Toxaphene + Parathion (6.0 lb.) | 1/3 gal. + 1 pt. or | See remarks. | |
| | (4.0 lb.) | 2 2/3 pt. + 1/2 pt. | | |

**Remarks**

*Parathion.* Do not substitute with methyl parathion.

*Toxaphene.* Do not graze dairy animals or animals being finished for slaughter in treated fields. Do not ensile treated forage.

## False Chinch Bugs

Although smaller in size, the false chinch bug is similar in appearance and habits to those of the chinch bug. False chinch bugs have sucking, stylet-type mouthparts and usually are found feeding chie[illegible] on the heads of sorghum plants. Reduced seed weight and quality result from false chinch bug feeding.

Populations of false chinch bugs often are clumped, making pesticide applications only to infested field areas possible. Pesticide application should be made when an average of 140 false chinch bugs per head are found.

SUGGESTED INSECTICIDE CONTROL

| Pest | Insecticide: Toxicant per gallon or pound | Insecticide: Concentrate per acre | Days from last application to: Harvest | Days from last application to: Grazing |
|---|---|---|---|---|
| False chinch bug | Parathion (4 lb.) | 1/3-1/2 pt. | See remarks. 12 | 12 |

Remarks

*Parathion.* Do not substitute with methyl parathion.

## Flea Beetles

Flea beetles are regarded as occasional and minor pests of sorghum in Texas. These very small, shiny, roundish beetles vary in color from brown to grayish-black and damage sorghum by chewing small holes in leaves. Heavy damage causes leaves to have a sieve-like appearance. Adult beetles readily jump from the plant when disturbed.

Cultivation practices and/or the use of herbicides that provide for weed-free fields and field borders are important and effective in reducing flea beetle numbers and damage. Proper seed bed preparation and time of planting promote rapid sorghum plant

SUGGESTED INSECTICIDE CONTROL

| Pest | Insecticide: Toxicant per gallon or pound | Insecticide: Concentrate per acre | Days from last application to: Harvest | Days from last application to: G[illegible]zing |
|---|---|---|---|---|
| Flea beetle | Toxaphene (6 lb.) | 1 1/3 qt. | See remarks. | |

Remarks

*Toxaphene.* 1 1/3 quarts; do not apply within 28 days of harvest. Apply only once after heads start to form. Do not graze dairy animals or animals being finished for slaughter on treated fields. Do not ensile treated forage.

emergence and growth and also aid in reducing flea beetle damage.

## Sugarcane Borer — Southwestern Corn Borer

These closely related pests of sorghum, corn and other crops damage plant stalks by their tunneling activity. Buff-colored adult moths lay eggs in shingle-like arrangement on the leaves and stalks of host plants. Young larvae of the sugarcane and Southwestern corn borer are characteristically creamy white and marked with brown to black spots. Spots of the more mature overwintering larval stage are less distinctive or absent. Larvae overwinter in the stalks or root crowns of sorghum plants and other crop debris.

Borer infested stalks are reduced in diameter and plant lodging often results. Dead heart or dying of the whorl of the plant and an increased susceptibility to stalk rotting diseases are also associated with borer damage.

Cultivation practices that destroy stalks, expose larvae and bury crop residues greatly reduce borer populations. Rotation with non-host crops and early planting of sorghum also aid in control of the sugarcane and Southwestern corn borer. Presently no insecticides are labeled for control of this borer complex on grain sorghum.

## Lesser Cornstalk Borer

Larvae of the lesser cornstalk borer attack the root system and lower stalk of sorghum plants. Larvae are light bluish-green with prominent transverse bands of brown. They feed in silken tunnels covered with soil particles. After completion of feeding, larvae pupate in silken cocoons under crop debris.

Cultivation practices that reduce crop residues, early planting and rotation to non-host crops are recommended for lesser cornstalk borer control.

**SUGGESTED INSECTICIDE CONTROL**

| Pest | Insecticide: Toxicant per gallon or pound | Insecticide: Concentrate per acre | Days from last application to: Harvest | Days from last application to: Grazing |
|---|---|---|---|---|
| Lesser cornstalk borer | Diazinon (14.3% G) | 7-8 lb. | See remarks. | |

**Remarks**

Apply granules in a band 10 inches wide over seed furrow or seedling plants. Apply simultaneously with planting, just after seed drop and seed press wheel and in front of covering shovels, press wheel or chain drag. Soil coverage is important.

## INSECTICIDE APPLICATION METHODS

Ground machines or aircraft may be used to apply most insecticides to sorghum. For best results with aerial applications, flag the swaths so that they meet or overlap.

Spray applications are most effective and hazards minimized when wind velocity does not exceed 15 miles per hour. Avoid spraying when plants are wet. For broadcast crops, number 3 cone nozzles set 20 inches apart on a rear-mounted boom of a tractor sprayer are satisfactory. A pump pressure of 60 pounds per square inch is recommended.

Nozzle size and number, ground speed and pressure influence the rate of output per acre; therefore, calibrate the sprayer carefully to insure application of recommended insecticide amounts. One nozzle per row usually is adequate for young row crops, but two to three nozzles per row may be desirable on larger plants to obtain adequate coverage. See L-486, *Insecticidal Spraying of Field Crops with Ground Machinery* and L-764, *Pesticide Application Ground Equipment Calibration Guide* for additional information.

## PRECAUTIONS

A number of insecticides discolor the foliage of certain grain sorghum varieties. Yield losses have resulted from extensive leaf damage following the use of these chemicals on susceptible grain sorghum hybrids. Before application, check the insecticide label closely and consult the manufacturer and the seed company regarding possible phytotoxic effects. Where extensive phytotoxicity has occurred in research programs, the chemicals involved have been eliminated from the recommendations in this publication.

## PROTECTING BEES AND OTHER POLLINATORS FROM INSECTICIDES

Pollination is extremely important in producing many seed crops. This is particularly true for legumes such as alfalfa, clovers and vetch. Most grass-type plants are wind- or self-pollinated and do not require the assistance of insect pollinators. Where pollen-collecting insects are required for flower fertilization, the producer, insecticide applicator and beekeeper should cooperate closely to minimize losses of bees. The following guidelines will reduce bee losses:

1. Apply insecticides, if practical, *before* bees are moved into fields for pollination.

2. Where insecticides are needed, use materials least toxic to bees.
3. Make all applications when bees are away from the field. Evening or early morning treatments between the hours of 7 p.m. and 6 a.m. generally are more satisfactory. Evening applications, after bees have left the field, are less hazardous than early morning applications.
4. Use spray or granular formulations.
5. Where it is necessary to use an insecticide from groups 1 or 2 in the following list, notify beekeepers so they can make necessary arrangements to protect their bees.
6. To prevent heavy losses of bees, avoid drifting or spraying any insecticide directly on colonies. Bees often cluster on the front of their hives on hot evenings. Pesticide drift or direct spray at this time generally results in high mortality.

**INSECTICIDES GROUPED ACCORDING TO THEIR RELATIVE HAZARDS TO HONEY BEES**

| Insecticides | Remarks |
|---|---|
| **Group 1—Highly Toxic**<br>Carbaryl (Sevin)<br>Diazinon<br>Malathion (wettable powder or ULV)<br>Parathion<br>Dimethoate (Cygon, DeFend) | This group includes materials that kill bees on contact during application or for several days following application. Remove bees from the area if these are used on plants being visited by the bees, with some exceptions. Malathion occasionally causes heavy bee losses, particularly during periods of extremely high temperatures. Make malathion applications in the evening after all bees have completed foraging. Avoid ultra-low-volume malathion after blooms appear. |
| **Group 2—Moderately Toxic**<br>Malathion (EC)<br>Methomyl (Lannate)<br>Carbophenothion (Trithion)<br>MSR (Meta-Systox-R) | Do not apply when bees are working in field. Apply in late evening. |
| **Group 3—Relatively Non-Toxic**<br>Demeton (Systox)<br>Toxaphene | Make applications in late evening or early morning when bees are not foraging. |

# POLICY STATEMENT FOR MAKING CHEMICAL CONTROL SUGGESTIONS

Suggestions for use of pesticides made by the Texas Agricultural Extension Service and the Texas Agricultural Experiment Station are based upon:

- Effectiveness under Texas conditions.
- Avoidance of residues in excess of allowable tolerances.
- Avoidance of toxicity to desirable vegetation, animals and humans.
- Avoidance of adverse side effects upon beneficial predators, parasites, honeybees, fish and other wildlife, plants, animals and humans.

Suggested pesticides must be registered and labeled for use by the Environmental Protection Agency and the Texas Department of Agriculture. The status of pesticide label clearances is subject to change and may have changed since this publication was printed. County Extension agents and appropriate specialists are advised of changes as they occur.

The USER always is responsible for the effects of pesticide residues on his livestock and crops, as well as problems that could arise from drift or movement of the pesticide from his property to that of others. Always read and follow carefully the instructions on the container label.

Proper disposal of waste pesticides and "empty" or used containers is an essential step in the safe use of pesticides. For additional information see L-1008, *Disposal — Pesticide and Pesticide Containers.*

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